

Review on farm environment, genes and development of asthma and allergies

Charlotte Braun-Fahrlander, *Department of Epidemiology and Public Health, Swiss Tropical and Public Health Institute, Basel and University of Basel, Switzerland*

Juha Pekkanen, *Department of Environmental Health, National Institute for Health and Welfare, Kuopio, Finland*

Gert Doekes, *Utrecht University, Institute for Risk Assessment Sciences, Utrecht, the Netherlands*

Joseph Riedler, *Children's Hospital Schwarzach, Austria*

Jon Genuneit, *Institute of Epidemiology, University of Ulm, Germany*

Erika von Mutius, *LMU, Munich, University Children's Hospital, Munich Germany*

Jean-Charles Dalphin, *Department of Respiratory Disease, University Hospital, Besançon, France*

Roger Lauener, *CK-Care, Zurich and High Mountain Hospital, Davos-Wolfgang, Switzerland*

Wolfgang Kneifel, *BOKU Vienna, University of Natural Resources and Life Science, Austria*

Dick Heederik, *Utrecht University, Institute for Risk Assessment Sciences, Utrecht, the Netherlands*

Background and Aims

Children growing up on farms are protected from asthma and atopy when compared to rural peers, yet the mechanisms underlying these effects are not exactly known. The review will summarize new findings mainly from two studies of the farming environment, i.e. PASTURE, a birth cohort and GABRIEL, a cross sectional study.

Methods

PASTURE has followed a birth cohort of 1063 children (half from farm families) from pregnancy up to age 6 yrs with extensive questionnaires, biological and environmental sampling and, immunological measurements. GABRIEL is a cross-sectional study of 9668 school-aged children, including 7606 with IgE measurements and 1708 with extensive genotyping data. Extensive environmental sampling was performed in about 800 children in one GABRIEL study area.

Results

Genome-wide interaction analysis for asthma and atopy and farm-related exposures in the GABRIEL study showed that the strong protective effect of a farm environment could not be attributed to the genetic make-up of the farming population nor to common genetic polymorphisms interacting with particular exposures. Exposure to a greater variety of environmental micro-organisms, however, was associated with a reduced risk of asthma (OR 0.86 (95%CI 0.75-0.99)). Consumption of raw milk was inversely associated with asthma (aOR 0.59, 95% CI 0.46-0.74), atopy (0.77, 0.61-0.90) and hay fever (0.51, 0.37-0.69) independent of farming.

The longitudinal analyses of the PASTURE birth cohort showed that prenatal exposures modified atopic sensitization and cytokine patterns in cord blood and could influence the development of atopic dermatitis within the 2 first year of life. Gene expression of innate immunity receptors (TLR's) were decreased in children with atopic dermatitis.

Conclusions

The ongoing analyses of the cohort study will greatly enhance the understanding of the mechanisms underlying the protective effect of farm related exposures and hopefully open new avenues for prevention.